Co-Existence

Cultivating

GM and non-GM crops in Europe

Simon Barber, Plant Biotechnology Unit, EuropaBio

Plant Biotechnology Unit of EuropaBio

EuropaBio

50+ Corporate & Associate Members
25 National Associations (>1500 members)
Red, white and green

http://www.europabio.org

Plant Biotechnology Unit (green)

Bayer CropScience
BASF Plant Science
Dupont/Pioneer HiBred
Dow AgroScience
KWS
Limagrain Group
Monsanto
Syngenta
Crop Design

Simon Barber

Farm Worker (1966)
University in UK,
Agriculture/Botany/Ecology
Ag. Extension in Zambia
Post Graduate/Canada
Weed Science/Ecology

1982

Plant Breeding/Canada
Plant Biotechnology
Regulation/Canada
Biotechnology Regulatory
Harmonization/OECD
EuropaBio, Brussels (1999 -)

2005

Technology providers and integrators

Opportunity to Operate - Responsibly

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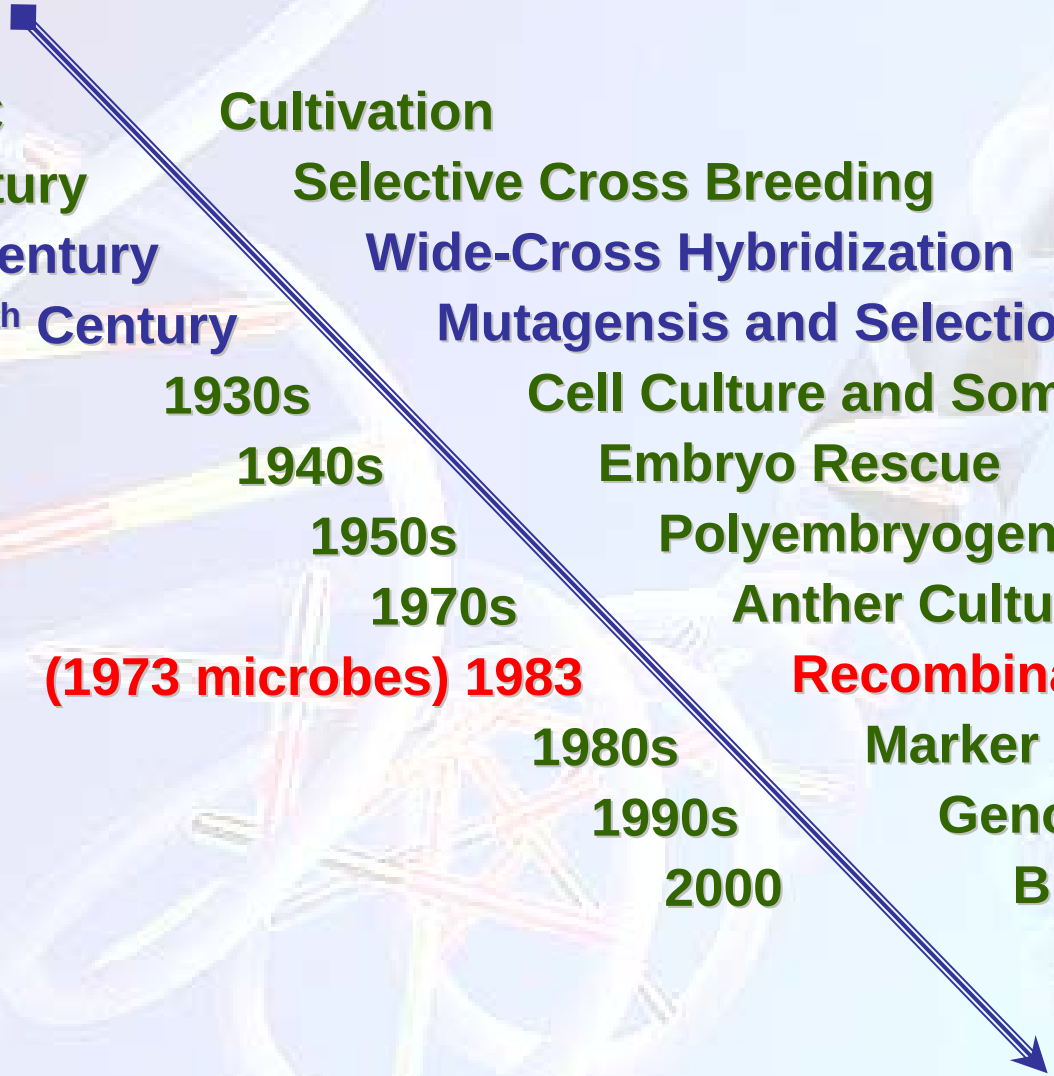
“Co-existence”

Crop Breeding Technology Timeline



2,000 BC — Cultivation

19th Century — Selective Cross Breeding

Early 20th Century — Wide-Cross Hybridization

Mid 20th Century — Mutagensis and Selection

1930s — Cell Culture and Somaclonal Variation

1940s — Embryo Rescue

1950s — Polyembryogenesis

1970s — Anther Culture

(1973 microbes) 1983 — Recombinant DNA

1980s — Marker Assisted Selection

1990s — Genomics

2000 — Bioinformatics

New Full Text Search New "Make a Field Trial Table!"

Country	Company	Common Name	ScientificName	Year
Belgium	Plant Genetic Systems	Tobacco	Nicotiana tabacum	1986

New Full Text Search New "Make a Field Trial Table!"

Different potato varieties

“coexisting” in the same field

CO-EXISTENCE What have we done to manage this?

In agriculture this is about:

- purity of a product – to meet the needs of the end user
- adventitious presence of other materials in a product, for instance:
  - wheat seeds in a shipment of soybeans
  - wheat seeds in a shipment of barley
  - ***"soft"*** feed wheat seeds in a shipment of ***"hard"*** bread wheat
  - an ***"off-type"*** wheat seed in a bag of certified seed of a wheat variety

--

  - a "HEAR" rapeseed seed in food quality rapeseed
  - a food quality rapeseed seed in "HEAR" rapeseed

Means to achieve co-existence

- In an open air biological production system (*farming*) admixtures can rarely be totally avoided
- The "*industry*" sets and achieves realistic thresholds and achieves co-existence of different production systems and produce
- Agreed upon thresholds enable the system to function, achieving agreed on purity with economically acceptable costs:
  - commodity (harvested grain) production
  - identity preserved production
  - contract production
  - certified (for sowing) seed production

- These examples do not demand a *ZERO* threshold
- These examples do not demand a threshold at the level of detection

Co-existence – another example – meeting the need to provide *choice* :

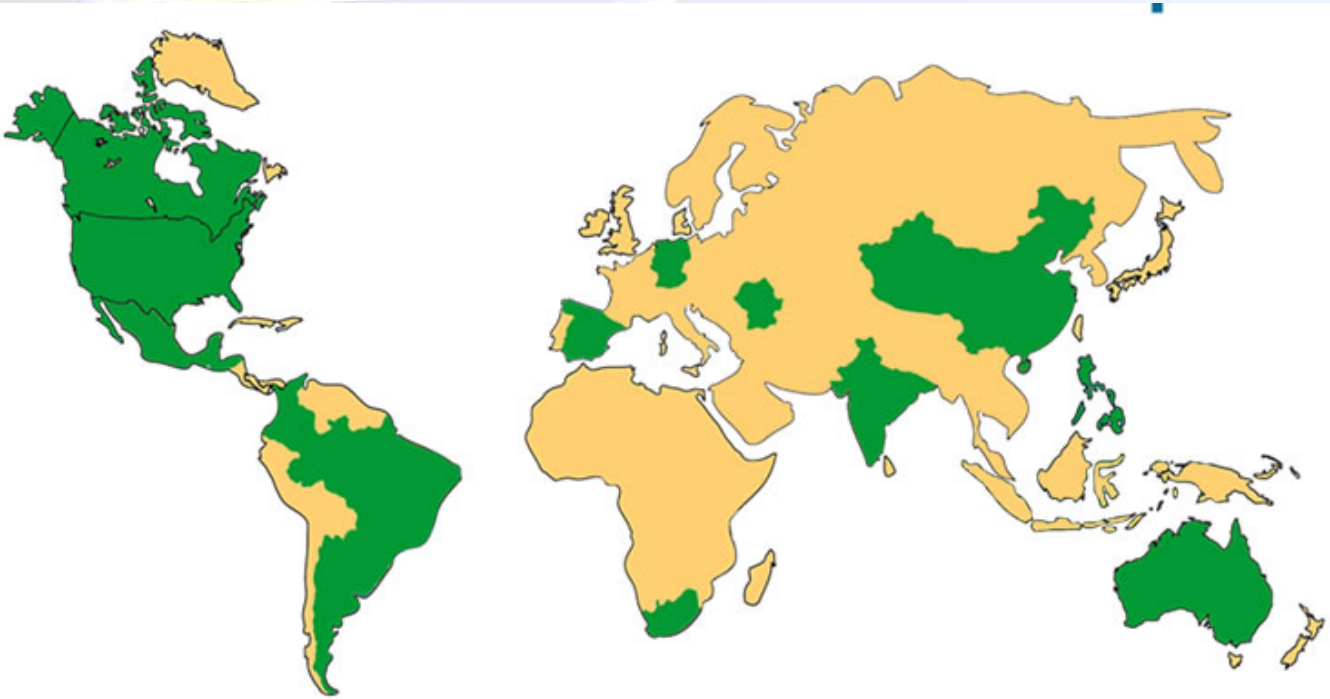
Different farming philosophies and practices:

- Modern “conventional”
- “Bio” or “organic”
  Managed through “process” rules

“Genetic Modification” In agriculture

- **ONE tool for plant breeders**
- **Today, we focus on a few “traits”**
  - **“novel” herbicide tolerance**
  - **insect resistances**
  - **disease resistances**
- **Others “traits” will follow**
  - **Nutritional enhancement**
  - **abiotic stress tolerances**
  - **specialty protein and chemical production**

Global Area (Million Hectares) of 17 Biotech Countries, 2004 – 11 of 17 are dev. countries

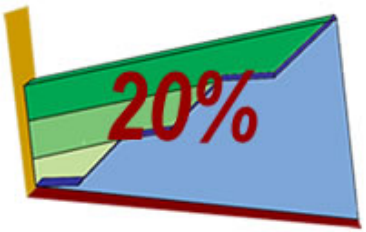


Biotech Mega-Countries

50,000 hectares, or more

USA	47.6 million
Argentina	16.2 million
Canada	5.4 million
Brazil	5.0 million
China	3.7 million
Paraguay	1.2 million
India	0.5 million
South Africa	0.5 million
Uruguay	0.3 million
Australia	0.2 million
Romania	0.1 million
Mexico	0.1 million
Spain	0.1 million
Philippines	0.1 million

Increase over 2003



17 countries which have adopted biotech crops

In 2004, global area of biotech crops was 81 million hectares, representing an increase of 20% over 2003, equivalent to 13.3 million hectares.

Less than 50,000 hectares

Colombia Honduras Germany

** Developing countries*

Source: Clive James, 2004

2004 – 9 years of commercial growing approved GM crops

- 81 million hectares globally
- HALF world's population in 17 biotech crop growing countries
- 8.25 million farmers choose to grow biotech crops
- 60,000 hectares of Bt maize in Spain
- 2,000 tightly controlled hectares of Bt maize in France and Germany(?)
- Biotechnology crops result in CHANGE in agriculture
- ZERO cases of harm to humans or animals resulting from biotech crops

Where are we in the EU today?

GM in Agriculture

- **A full GM regulatory framework in place**
  - **Directive 2001/18/EC**
  - **Regulations (EC) Nos 1829 & 1830/2003**
- **Approving products (hesitantly)**
- **Through labelling and traceability, providing EU citizens with choice (the European Co-Decision procedure)**

0.9% community labelling threshold

- **Importing millions on tonnes of EU approved GM product**

- **Discussing measures required for cultivation of biotech crops so as to provide choice**

Co-existence

- **Commission's 2003 *Guidelines* on coexistence**
- **Member States developing *Rules* (legally binding, or guidelines)**

Our discussions today are about “choice”

not

about safety

Where is the EU going with co-existence ?
The EU Community Co-existence rules

- Amended 2001/18/EC – Art 26, a

  "Member States may take appropriate measures to avoid the unintended presence of GMO's in other products"

- Commission's Guidelines, 2003

  Co-existence as an issue relates to 'the *economic consequences* of adventitious presence of material from one crop in another and the principle that farmers should be able to cultivate freely the agricultural crops they choose, be it GM crops, conventional or organic crops'

Some Member States are developing legislation

- Denmark
- Austria, and regions
- Germany (part of 2001/18/EC implementation)
- Italy
- Netherlands (guidelines)
- Others drafting – France, Spain, Portugal, Sweden *etc*

EU Member State co-existence rules

- Proportionate? – taking into account:
  - existing non-GM co-existence practices
  - safe, fully approved products
    - Directive 2001/18/EC – Deliberate Release
    - Regulation (EC) No 1829/2003 –GM Food & Feed
  - community 0.9% labelling threshold through the “Co-Decision procedure”
- Fair or discriminatory?
- Enabling or prohibiting?
- Observing EU law?

GM crops in Europe

- Insect resistant (IR) maize in Spain: since 1998
- Herbicide tolerant (HT) soy in Romania: since 1999
- 2004: 58,000 ha Spain (12% of crop), 70,000 ha Romania (58% of crop)

Graham Brookes, PG Economics Ltd, June 2005

Farm level of GM crops in Europe

	Average	Range
Spain: yield impact	+6.3%	+1% to +15%
Romania: yield impact	+31%	+12% to +50%
Spain: increase in farm gross margin	+13%	Zero to +29%
Romania: increase in gross margin	+156%	+12% to +300%

Graham Brookes, PG Economics Ltd, June 2005

National level impact of GM crop use

Million Euros	2004	Cumulative since first grown	Value added as % of national production value 2004
IR maize: Spain	+5.2	+18	+1
HT soy: Romania	+14.8	+31.4	+25

Graham Brookes, PG Economics Ltd, June 2005

http://www.coexistence.ethz.ch/PDF/coex-Sanvido.pdf

A concept for coexistence of GM and non-GM crops in Switzerland

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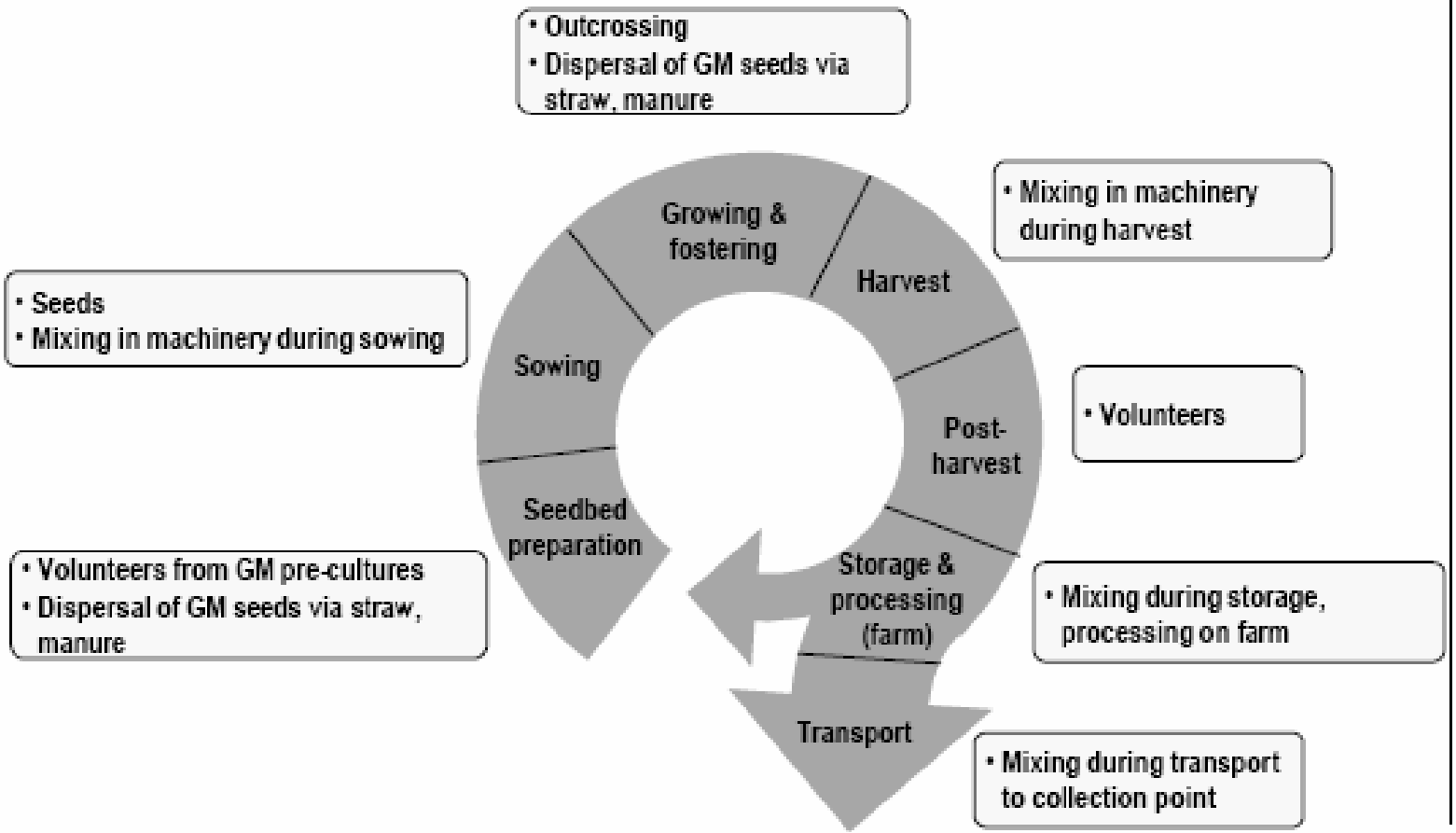
GM-dispersal routes into agricultural production



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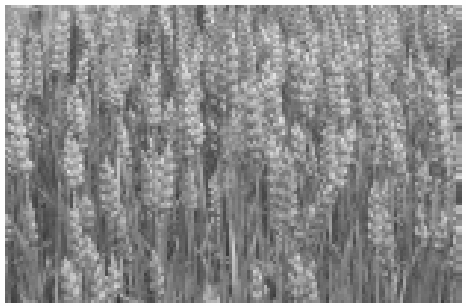
A proposal for a coexistence concept in Switzerland

Coexistence measures differ according to the biological properties of the crop:

Maize	Wheat	Oilseed rape
		
Outcrossing	--	Outcrossing & volunteers

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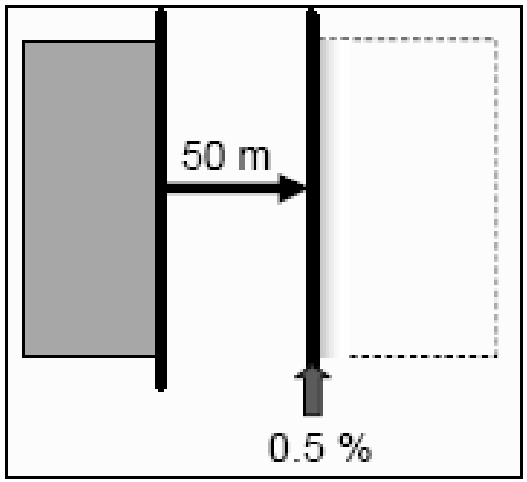
Pollen dispersal, outcrossing, isolation distances

Analysis of available gene flow data in maize:

Goal:
Determine isolation distance needed in order to reach 0.5 % at the field border

Criteria:
Use studies with realistic cultivation conditions – comparable field sizes, comparable quantities of competing pollen



Source of data:
Twelve recent international studies plus unpublished data from a Swiss study:

APROSE & IRTA - Spain
BBA & Erprobungsanbau - D
POECB - France
Farm Scale Evaluations - UK

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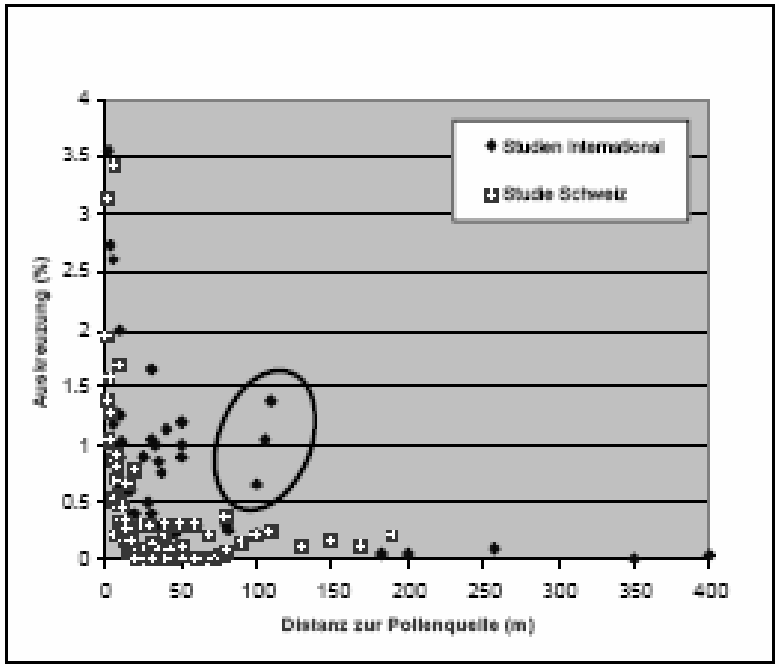
Pollen dispersal, outcrossing, isolation distances

Analysis of available gene flow data in maize:



Results:

- Outcrossing rate decreases exponentially with increasing distance
- Beyond 50 metres, the rate is below 0.5 % at the field border
- Dilution effect that additionally takes place during harvest is not taken into account

➲ outcrossing rate over the whole field is significantly lower than 0.5 %

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Are the isolation distances recommended in the FAL study likely to be too low?

Pollen is dispersed by wind and by insects. Maize pollen is dispersed almost exclusively by the wind, whereas in the case of oilseed rape, some of the pollen is also dispersed by insects.

- *With regard to maize, our proposed distances of 25 metres for silage maize and 50 metres for grain maize have consistently been confirmed by recent studies*.

In experimental out-crossing trials in Europe,

- *no out-crossing rates higher than 0.9% were measured at distances over 25 metres in maize (APROSE 2004 and IRTA 2004, Spain; BBA 2002 and Erprobungsanbau 2004, Germany; POECB 2002, France; Farm Scale Evaluations 2003, UK). Out-crossing rates in fact generally decrease rapidly within the first 20 metres*.

http://www.coexistence.ethz.ch.

Pollen dispersal, outcrossing, isolation distances

Recommended isolation distances for maize:

Grain maize : 50 metres

Silage maize: 25 metres

Results confirmed by:

"Erprobungsanbau Germany 2004"

- 20 metres isolation distance is sufficient for silage maize to keep GM-level below 0.9%

Agreement in the Netherlands 2004 – cultivation of Bt-maize:

- 25 metres isolation distance to conventional maize fields
- 250 metres isolation distance to organic maize fields

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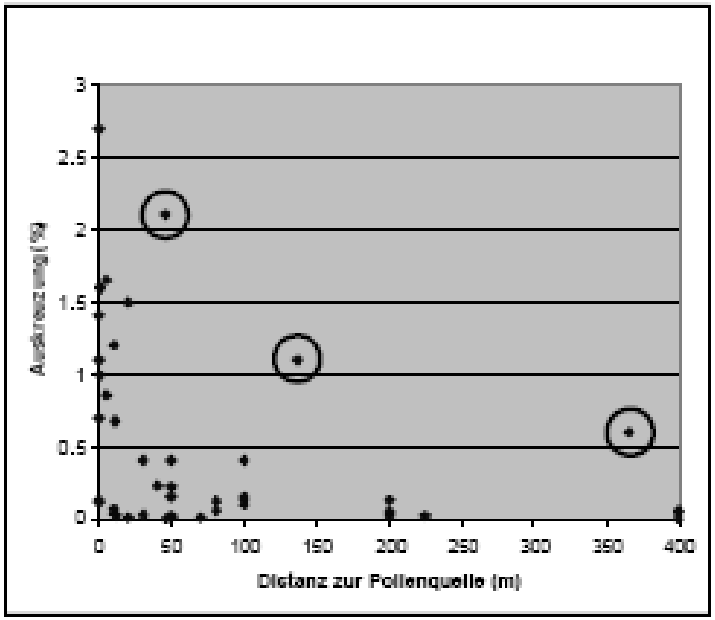
Pollen dispersal, outcrossing, isolation distances

Analysis of available gene flow data in fertile oilseed rape varieties:



Source of data:
Eleven recent international studies

Results:

Beyond 50 metres, the rate is below 0.5 % at the field border

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Pollen dispersal, outcrossing, isolation distances

Recommended isolation distances for oilseed rape :

Fertile varieties: 50 meters

Varieties with male-sterile components: 400 meters
(as in certified seed production)

Results confirmed by:

Damgaard & Kjellsson 2005 :

- 50 metres isolation distance is sufficient for smaller fields to keep GM-level below 0.3%

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Spatial aspects of coexistence

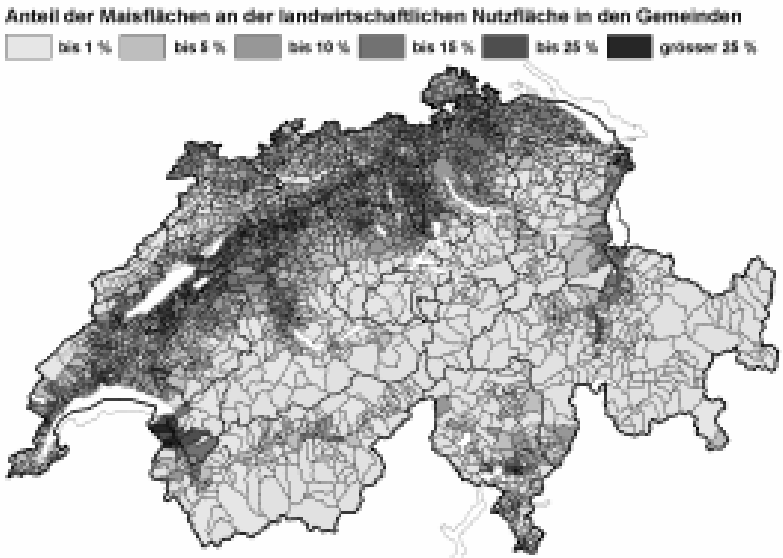
Is a 50 m isolation distance for maize feasible in Switzerland?

First approach:

Calculation of the area required to allow for spatial isolation of 10% GM maize in every Swiss commune

Data basis:

- Maize acreage of all Swiss communes
- Available arable land per commune



Agricultural farming data survey 2003 OFS

Spatial aspects of coexistence

Conclusions:

- Arable land needed to allow for isolation of 10% GM-maize cultivation is available in the majority of the cases
- An isolation distance of 50 metres between maize fields is often possible
- Need for coordination measures differs regionally. Efforts depend on landscape structures and on agricultural production systems
- In areas with a high proportion of maize cultivation, agreements between farmers would often be necessary

Conclusions

- Existing experiences for identity preservation should be used when implementing coexistence measures
- From an agricultural point of view, coexistence would be possible for maize, oilseed rape and wheat in CH within the current legal threshold of 0.9 %
- However, farmers would have to undertake a series of technical and organisational measures
- Final decision on adopting GM crops in Switzerland lies with the farmers and consumers

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Thank You